

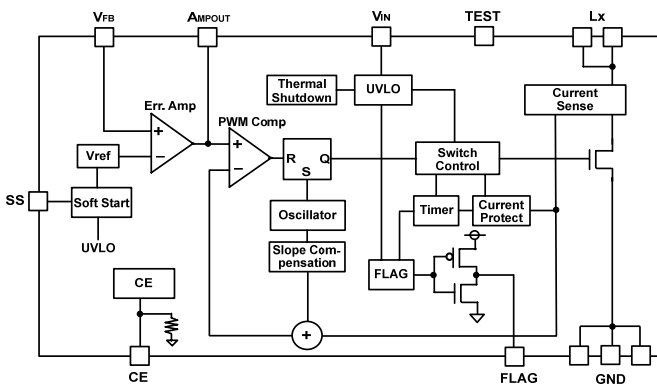
The R1213K Series are low supply current, CMOS-based PWM step-up DC/DC converters. R1213K includes a soft start circuit, an under-voltage lockout circuit (UVLO), a thermal shutdown circuit, and a latch protection circuit. By simply using an inductor, resistors and capacitors as external components, a high-efficiency step-up DC/DC converter can be easily configured. The soft start time as well as phase compensation can be set with external resistors and capacitors. Built-in a timer latch protection circuit. Built-in a shutdown control circuit. It turns off the external Pch MOSFET at the latch protection time, so it cut off the power line from  $V_{DD}$  to  $V_{OUT}$ . To release the latch protection, change to the stand-by mode by the CE pin, or change the  $V_{DD}$  voltage lower than the UVLO detect voltage.

### FEATURES

- Supply Current ( $I_{DD1}$ )..... Typ. 550 $\mu$ A ( $V_{IN}=5.5V$ ,  $V_{FB}=0.9V$ )
- Supply Current ( $I_{DD2}$ )..... Typ. 3 $\mu$ A ( $V_{IN}=5.5V$ ,  $V_{FB}=0V$ )
- Standby Current ( $I_{standby}$ )..... Max. 1.5 $\mu$ A ( $V_{IN}=5.5V$ ,  $V_{CE}=0V$ )
- Input Voltage Range ( $V_{IN}$ )..... 2.3V to 5.5V
- Output Voltage Range ( $V_{OUT}$ )..... 0.3V to 15.0V (Externally adjustable)  
(Feedback voltage : 0.8V)
- Output Voltage Accuracy .....  $\pm 1\%$
- Temp. coeff. of Feedback Voltage .....  $\pm 50$ ppm/ $^{\circ}C$
- Oscillator Frequency ( $f_{osc}$ )..... 1MHz
- Oscillator Maximum Duty Cycle (Maxduty) .. Typ. 90%
- Lx limit Current ..... Typ. 3A
- UVLO Detect Voltage ( $V_{UVLO}$ ) ..... Typ. 2.0V
- Soft Start Time ( $t_{start}$ )..... Can be set by SS pin
- Latch Protection Circuit ..... Delay time for protection Typ. 32ms
- Package ..... DFN(PLP)2730-12

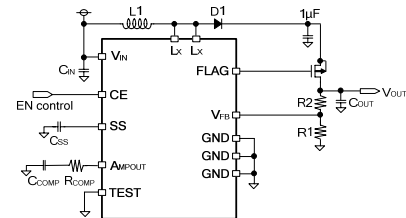
### BLOCK DIAGRAM

R1213K

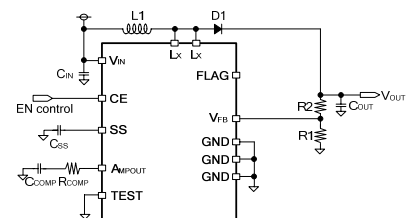


### TYPICAL APPLICATION

In the case of cut off the power line from  $V_{IN}$  to  $V_{OUT}$  with an external Pch MOSFET.



In the case of cut off the power line from  $V_{IN}$  to  $V_{OUT}$  without an external Pch MOSFET.



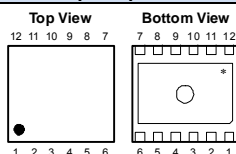
FLAG Pin should be open.

### SELECTION GUIDES

Halogen Free	Package	Q'ty per Reel	Part No.
H/F	DFN(PLP)2730-12	5,000 pcs	R1213K00*-TR

### PACKAGES (Top View)

DFN(PLP)2730-12



1	AMPOUT	7	TEST
2	VFB	8	Lx*
3	CE	9	Lx*
4	GND*	10	VIN
5	GND*	11	FLAG
6	GND*	12	SS

\*) The tab is substrate level (GND).

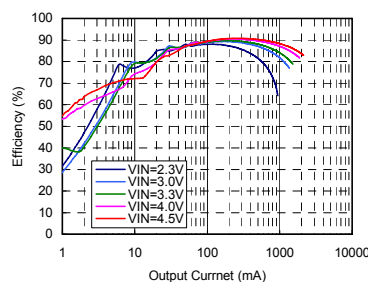
\*1) No.4,5 pin and No.6 pin, No.8 pin and No.9 pin must be wired each other when it is mounted on board.

\* : Select from (A) Low output voltage (3.0V to 6.0) or (B) high output voltage (6.0V to 15.0V).

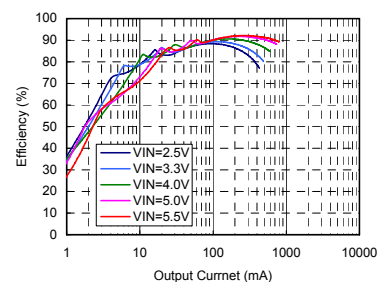
### TYPICAL CHARACTERISTIC

R1213K00x Efficiency vs. Output Current

R1213K001A ( $V_{OUT}=5.0V$ )



R1213K001B ( $V_{OUT}=15.0V$ )



### APPLICATIONS

- Flash LED, Data card, DSC, LCD source Bias Supplies

## 2.5A PWM Step-up DC/DC Converter

## Phase compensation

The R1213K requires external phase compensation to prevent from large output ripple and unstable operation and low efficiency. To make phase compensation, connect a resistance  $R_{COMP}$  and a capacitor  $C_{COMP}$  in series between AMPOUT and GND.

The resistance and capacitance values can be calculated with next formulas. The values are the basic values, however, to judge if they are appropriate or not, check the transient response and cut and try for adjustment.

(A Version)

$$R_{COMP} = 90 \times V_{IN} \times V_{OUT} \times C_{OUT} / (L \times I_{OUTmax})$$

$$C_{COMP} = 30 \times V_{OUT} \times L \times I_{OUTmax} / (V_{IN}^2 \times R_{COMP})$$

(B Version)

$$R_{COMP} = 45 \times V_{IN} \times V_{OUT} \times C_{OUT} / (L \times I_{OUTmax})$$

$$C_{COMP} = 30 \times V_{OUT} \times L \times I_{OUTmax} / (V_{IN}^2 \times R_{COMP})$$

$V_{IN}$ (V)	$V_{OUT}$ (V)	$I_{OUTmax}$ (mA)	$C_{IN}$ (μF)	$C_{OUT}$ (μF)	$L1$ (μH)	D1	$R_{COMP}$ (kΩ)	$C_{COMP}$ (nF)
3.3	3.8	1200	10	20	2.2	3A	8.2	3.3
3.3	5.0	800			4.7		8.2	6.8
3.3	12.0	250			4.7		27.0	1.8
5.0	15.0	650			6.8		15.0	5.1

## Setting of Output Voltage

Output voltage can be set with divider resistors for voltage setting, R1 and R2 as shown in the typical application. Refer to the next formula.

$$\text{Output Voltage} = V_{FB} \times (R1+R2)/R1 \quad (V_{FB}=0.8V)$$

\*) Recommended value of resistors ( $R1 + R2$ ) is equal or less than 200kΩ.

## Setting of Soft start time

Soft-start time can be set by connecting a capacitor "C<sub>SS</sub>" between SS pin and GND.

Soft start time can be calculated by the next formula.

$$\begin{aligned} \text{Soft start time} &= C_{SS} \times V_{FB} / I_{SS} \quad (V_{FB}=0.8V, I_{SS}=10\mu A) \\ &= 8 \times C_{SS} \times 10^4 \text{ (s)} \end{aligned}$$

## Ricoh Co.,LTD. Electronic Devices Company



■ Ricoh presented with the Japan Management Quality Award for 1999.  
Ricoh continually strives to promote customer satisfaction, and shares the achievements of its management quality improvement program with people and society.



■ Ricoh awarded ISO 14001 certification.  
The Ricoh Group was awarded ISO 14001 certification, which is an international standard for environmental management systems, at both its domestic and overseas production facilities. Our current aim is to obtain ISO 14001 certification for all of our business offices.



Ricoh completed the organization of the Lead-free production for all of our products. After Apr. 1, 2006, we will ship out the lead free products only. Thus, all products that will be shipped from now on comply with RoHS Directive.

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